Claims

1. An axial flow impeller (1), rotationally driven by a motor (3a) about an axis (2) in a direction (V) in a plane (XY), comprising a central hub (3) of diameter (D1), a plurality of blades (4), each blade having a base (5) with a theoretical starting radius (Rmin), and a tip (6) that extends to an end radius (Rmax), the blades (4) being delimited by a concave leading edge (7) and a convex trailing edge (8), characterised in that the blades (4) include box-shaped portions (20) that define a seat (21) with a diameter (D2) greater than the diameter (D1) of the housing of the electric motor (3a).

2. The axial flow impeller (1) in accordance with claim 1, characterized in that it comprises a discoidal central hub (3), a plurality of blades (4); each blade having a base (5) with a theoretical starting radius (Rmin), and a tip (6) that extends to an end radius (Rmax), the blades (4) being delimited by a concave leading edge (7) and a convex trailing edge (8) and characterised in that the blades (4) include connecting and stiffening portions (20, 20a) between the hub (3) and the blades (4) themselves.

3. The axial flow impeller (1) in accordance with claim 1 or 2, characterised in that the leading edge (7) comprises a first circular arc segment (9) near the base (5) with a radius falling between 47.7% and 58.3% of the tip end radius (Rmax) and a second circular arc segment (10) near the tip (6) with a radius falling between 42.3% and 51.7% of the tip end radius (Rmax), and a radius of change between the two circular arc segments (9, 10) falling between 45% and 55% of the extension (Rmax - Rmin) of the blade (4).

4. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the trailing edge (8) comprises a first circular arc segment (11) near the base (5) with a radius falling between 27% and 33% of the tip end radius (Rmax) and a second circular arc segment (12) near the tip (6) with a radius falling between 44.1% and 53.9% of the tip end radius (Rmax), and a

radius of change between the two circular arc segments (11, 12) falling between 29.7% and 36.3% of the extension (Rmax - Rmin) of the blade (4).

5. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the leading edge (7) comprises a first circular arc segment (9) near the base (5) with a radius equal to 53% of the tip end radius (Rmax) and a second circular arc segment (10) near the tip (6) with a radius equal to 47% of the tip end radius (Rmax), and a radius of change between the two circular arc segments (9, 10) that corresponds to 50% of the extension (Rmax - Rmin) of the blade (4).

6. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the trailing edge (8) comprises a first circular arc segment (11) near the base (5) with a radius equal to 30% of the tip end radius (Rmax) and a second circular arc segment (12) near the tip (6) with a radius equal to 49% of the tip end radius (Rmax), and a radius of change between the two circular arc segments (11, 12) that corresponds to 33% of the extension (Rmax - Rmin) of the blade (4).

7. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the width of the blade (4) at the base (5) projected onto the plane (XY) is such as to make at the centre of the impeller an angle (B1) that falls between 36.9 and 45.1 degrees.

8. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the width of the blade (4) at the tip (6) projected onto the plane (XY) is such as to make at the centre of the impeller an angle (B2) that falls between 33.3 and 40.7 degrees.

9. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the width of the blade (4) at the base (5) projected onto the plane (XY) is such as to make at the

centre of the impeller an angle (B1) that is approximately equal to 41 degrees.

10. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the width of the blade (4) at the tip (6) projected onto the plane (XY) is such as to make at the centre of the impeller an angle (B2) that is approximately equal to 37 degrees.

11. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that, considering the projection of the blade (4) onto the plane (XY) and the direction (V) of rotation of the impeller (1), the tip (6) leads the base (5) by an angle (B3) of approximately 21 degrees at the centre of the impeller.

12. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the projection of the blade (4) onto the plane (XY) defines an intersection point (M) of the trailing edge (8) with the hub (3) and makes an angle (B4) equal to 25 degrees, the angle (B4) being formed by the respective tangent to the trailing edge (8) at point (M) and by a respective radius issuing from the axis (2) of the impeller (1) and passing through point (M).

13. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the projection of the blade (4) onto the plane (XY) defines an intersection point (N) of the trailing edge (8) with the tip (6) and makes an angle (B5) equal to 54 degrees, the angle (B5) being formed by the respective tangent to the trailing edge (8) at point (N) and by a respective radius issuing from the axis (2) of the impeller (1) and passing through point (N).

14. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the projection of the blade (4) onto the plane (XY) defines an intersection point (S) of the

leading edge (7) with the hub (3) and makes an angle (B6) equal to 22 degrees, the angle (B6) being formed by the respective tangent to the leading edge (7) at point (S) and by a respective radius issuing from the axis (2) of the impeller (1) and passing through point (S).

15. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the projection of the blade (4) onto the plane (XY) defines an intersection point (T) of the leading edge (7) with the tip (6) and makes an angle (B7) equal to 52 degrees, the angle (B5) being formed by the respective tangent to the leading edge (7) at point (T) and by a respective radius issuing from the axis (2) of the impeller (1) and passing through point (T).

16. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the blade (4) is defined by at least some of the aerodynamic profiles (13-19) of respective sections taken at various intervals of the radial extension of a blade (4), each profile (13-19) being defined by a centre line (L1) forming a smooth curve, without flexes or cusps, and by two angles of incidence (BLE, BTE) at the leading edge and at the trailing edge, said angles being defined by the respective tangents to the centre line (L1) at the point of intersection with the leading edge and with the trailing edge and a respective line perpendicular to the plane (XY) passing through the corresponding intersection points and also characterised in that the angles (BLE, BTE) of the profiles (13-19) have the values shown in the table below:

Profile	Radial extension (%)	Radius (mm)	BLE (degrees)	BTE (degrees)
13	0	27.5	65	20
14	19.44	40.6	72	30
15	37.68	52.9	75	42
16	55.89	65.2	77.5	50.5
17	72.59	76.5	80.58	56.27
18	88.35	87.1	79.34	62.02
19	1	95	73.73	72.55

17. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that the blade (4) is defined by

at least some of the aerodynamic profiles (13-19) of respective sections taken at various intervals of the radial extension of a blade (4), each profile (13-19) being defined by a centre line (L1) forming a smooth curve, without flexes or cusps, and also characterised in that the profiles (13-19) have a thickness S-MAX that falls between 2.26% and 2.42% of the tip end radius Rmax.

18. The axial flow impeller (1) in accordance with claim 15, characterised in that the profiles (13-19) have a thickness that is symmetrically arranged about the centre line (L1) and a thickness that initially increases, a maximum value S-MAX of approximately 20% of the length of the centre line (L1), and then progressively decreases up to the trailing edge 8 and in that the thickness are those shown in the following table:

Profile	Extension (%)	Radius (mm)	dimensionless thickness in relation to S-MAX					
			0% L1	20% L1	40% L1	60% L1	80% L1	100% L1
13	0	27.5	0.569196	1	0.846665	0.719688	0.591336	0.109558
14	19.44	40.6	0.600601	1	0.89373	0.763659	0.623011	0.126933
15	37.68	52.9	0.69237	1	0.973294	0.816338	0.664273	0.172666
16	55.89	65.2	0.694791	1	0.934996	0.817809	0.667854	0.179252
17	72.59	76.5	0.697084	1	0.935484	0.819178	0.671675	0.185418
18	88.35	87.1	0.702375	1	0.936645	0.822311	0.673064	0.199574
19	1	95	0.731532	1	0.913833	0.777364	0.624127	0.168607

19. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that it comprises seven blades (4) arranged at unequal angular intervals; the angular intervals, expressed in degrees, between one blade (4) and the next - taking for example the corresponding leading edge (7) or trailing edge (8) - being the following: 50.7; 106.0; 156.5; 205.2; 257;5; 312.9.

20. The axial flow impeller (1) in accordance with one of the previous claims, characterised in that it also comprises a ring (22) that is coaxial to the axis (2) of rotation and connected to the tip (6) of each blade (4).

21. The axial flow impeller (1) in accordance with claim 20, characterised in that it also comprises a frame (24) attached to the edge of the ring 22 and extending radially away from the axis 2 of rotation.